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High School Biology Training and Introductory College Biology Success

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High School biology teachers are occasionally concerned with curriculum problems such as:

1. Should BSCS biology be introduced in the curriculum, and if it is, will the students do well in the introductory biology courses in college?
2. Should two biology courses be offered at the high school level, and will the second course really prepare a student better for college biology?

In an attempt to answer these problems a survey was conducted during the winter quarter of 1967-68 in the Zoology Department at Colorado State University, Fort Collins. Two sections of the course, Man and the Animal World, which concerns the principles of zoology with special emphasis placed upon man, were surveyed. They were taught by different professors, and different tests to measure student achievement and understanding were administered. The student's final standing and grade in each section were based upon his total number of points accrued on tests, quizzes, and laboratory reports.

Materials and Methods

A total of 256 students completed the survey questionnaire properly. The questionnaire was as follows:

Z101 number .... Did you take a biology course Class Fr. Soph. Jr. Sr. in high school? yes no
Major ..... Did you take more than one biology course in high school? yes no Did you take a BSCS biology course in high school? yes no Have you had any previous biology courses (Botany, Zoology, Anatomy, or other) in college? yes no

The answers were recorded, the data tabulated, and seven different groups from each section were selected for comparison. Our null hypothesis was that there would be no differences in mean scores of the groups compared. The t-test was utilized in the statistical analysis. The 0.05 level of probability was accepted as significant. In selecting the individuals for the

groups, care was taken to insure that each individual had approximately the same background as indicated by the questionnaire, e.g., in comparing BSCS-trained freshmen who had no previous college biology, no individuals were selected who had had two high school biology courses. Because of the wide variation of choice of majors, no attempt was made to analyze the effect of this variable.

Results

Three of the groups were studied with respect to BSCS biology. Tables 1, 2, and 3 show the results of the t-tests for the three groups.

Tables 4 and 5 show the results of the comparisons of the effects of those students with two courses in high school biology with those students with one course in high school biology.

The comparisons of the effect of previous college biology (botany, zoology, anatomy, or other) with no previous college biology are shown in Tables 6 and 7.

Table 1
Comparisons of Group Means Involving BSCS Training vs. Non-BSCS Training

Section	n	df	Mean	Sum of Sums	t
I BSCS	29	28	415.44	87210	t = 2.61*
I non-BSCS	56	55	381.69	184649	
II BSCS	24	23	389.66	55874	t = 0.61
II non-BSCS	61	60	382.54	135494	

*Significant at the 0.05 level of probability

Table 2
Comparisons of Freshmen Group Means Involving BSCS-No Previous College Biology vs. non-BSCS-No Previous College Biology

Section	n	df	Mean	Sum of Sums	t
I BSCS	18	17	415.27	68117	t = 2.20*
I non-BSCS	44	43	377.93	134283	
II BSCS	10	9	383.40	14497	t = 0.35
II non-BSCS	22	21	376.27	70854	

*Significant at the 0.05 level of probability

Table 3
Comparisons of Upperclassmen Group Means Involving BSCS-No Previous College Biology vs. Non-BSCS-No Previous College Biology

Section	n	df	Mean	Sum of Sums	t
I BSCS	15	14	409.33	21667	t = 0.00
I non-BSCS	52	51	409.34	126632	
II BSCS	10	9	382.50	29661	t = 0.41
II non-BSCS	35	34	388.93	50901	

Table 4

Comparisons of Freshmen Group Means Involving the Effects of Two High School Biology Courses With No Previous College Biology Training vs. One High School Biology Course With No Previous College Biology Training

Section	n	df	Mean	Sum of Sums	t
I 2 HS biol.	18	17	401.66	42977	t = 1.17
I 1 HS biol.	44	43	383.31	166707	
II 2 HS biol.	7	6	419.14	11395	t = 2.54*
II 1 HS biol.	24	23	367.66	53046	

*Significant at the 0.05 level of probability

Table 5

Comparisons of Upperclassmen Group Means Involving the Effects of Two High School Biology Courses With No Previous College Biology Training vs. One High School Biology Course With No Previous College Biology Training

Section	n	df	Mean	Sum of Sums	t
I 2 HS biol.	15	14	390.00	34952	t = 1.61*
I 1 HS biol.	52	51	412.96	107513	
II 2 HS biol.	5	4	432.80	8489	t = 2.27*
II 1 HS biol.	36	35	383.80	71396	

*Significant at the 0.05 level of probability

Table 6

Comparisons of Freshmen Group Means Involving the Effects of Previous College Biology (Botany, Zoology, Anatomy, or Other) vs. No Previous College Biology

Section	n	df	Mean	Sum of Sums	t
I Previous	22	21	409.31	62669	t = 1.43
I no-previous	62	61	388.77	213838	
II Previous	7	6	407.57	9940	t = 4.72*
II no-previous	33	32	377.48	80795	

*Significant at the 0.05 level of probability

Table 7

Comparisons of Upperclassmen Group Means Involving the Effects of Previous College Biology (Botany, Zoology, Anatomy, or Other) vs. No Previous College Biology

Section	n	df	Mean	Sum of Sums	t
I Previous	50	49	408.28	99058	t = 0.30
I no-previous	17	16	412.47	50516	
II Previous	22	21	394.09	38426	t = 1.11
II no-previous	22	21	379.68	39809	

Discussion

The data in Table 1 indicate that there is no distinct advantage for students to have a BSCS biology course over one that is more traditionally oriented. However, the mean scores of the BSCS-trained students are higher in both sections than the mean scores of those students who indicated a traditional high school biology background. The BSCS freshman comparisons of Table 2 are similar to those in Table 1. Although the BSCS students in section I scored a significant difference, those in section II did not; therefore, there is no decisive difference between the training of the two groups. Table 3 indicates little if any difference between the BSCS upperclassmen and the non-BSCS trained upperclassmen. The mean scores are quite close to each other in value. Thus it would seem advantageous for the BSCS-trained student to take his introductory college biology course early in his college career.

Tables 4 and 5 present comparisons of the effects of a background of two high school biology courses versus one. As in the previous comparisons involving BSCS training, there is also a difference between the two sections. Section II of Table 4 indicates that there is a benefit; however, the sample is small and the analysis is of doubtful validity. The data from section I indicate that there is no significant difference. Table 5 shows that there is a significant difference among the upperclassmen. However, the difference in means is not as one would expect. In section I, the upperclassmen with only one high school biology class outscored the students with two high school biology classes by 25 points in the mean score. But once again the small size of one of the samples makes the comparison of dubious validity. As is indicated by the slightly higher mean scores in both sections, there also appears to be a small, but insignificant advantage for the freshman student to have had two high school biology courses prior to an introductory college biology course.

The comparisons of the effect of previous college biology (botany, zoology, anatomy, or other) with no previous college biology, Tables 6 and 7, indicated that there is little significant difference in the abilities of these students.

In summary, there appears to be a benefit for the freshmen to have a BSCS biology course. Overall, the BSCS students scored higher than their more traditionally-trained peers. There appears to be a small benefit for the freshman student to have had two high school biology courses. There is no advantage for the freshman or upperclassman to have a previous biology course in college.